

SUPPORT FOR THE AMENDMENTS

This Amendment cancels Claims 4, 10, 18, 23, 29 and 34; and amends Claims 1, 7, 15, 20, 26 and 31. Support for the amendments is found in the specification and claims as originally filed. In particular, support for Claims 1, 7, 15, 20, 26 and 31 is found in canceled Claims 4, 10, 18, 23, 29 and 34, respectively. No new matter would be introduced by entry of these amendments.

Upon entry of these amendments, Claims 1, 5-7, 11-15, 19-20, 24-26, 30-31 and 35-36 will be pending in this application. Claims 1, 15, 26 and 31 are independent. Claims 7, 11-14, 20 and 24-25 are withdrawn from consideration pursuant to a Restriction Requirement.

REQUEST FOR RECONSIDERATION

Applicants respectfully request entry of the foregoing and reexamination and reconsideration of the application, as amended, in light of the remarks that follow.

The present invention is directed to a piston made of aluminum cast alloy having improved thermo-mechanical fatigue resistance.

Claims 1, 4-6, 15, 18-19, 26, 29-31 and 34-36 are rejected under 35 U.S.C. § 103(a) over RU 2092604C1 ("RU-604") and "Aluminum standards and data 2003" page 1-6.

RU-604 discloses an aluminum-based alloy containing (in wt.%) "at least one other element selected from group comprising bismuth, barium, antimony, calcium, sodium, potassium and strontium 0.03-0.15". RU-604 at English-language abstract.

"Aluminum standards and data 2003" is cited for disclosing the addition of Na, Sr, Ca and/or P to 3xx and 4xx type Al-Si foundry alloys in order to modify the structure; and that 0.005-0.15% Ca and $\leq 0.060\%$ P are effective modifiers. Final Rejection at page 2, section 2, lines 10-13.

However, the disclosure in the cited prior art of a minimum of 0.005 wt% Ca fails to suggest the limitation of independent Claims 1, 15, 26 and 31 of an aluminum cast alloy that comprises "Ca (Calcium) : 0.0005-0.003 mass %". As discussed in the specification, a Ca content of 0.0005-0.003 mass % provides a desirable homogenous texture that is not achieved outside of this range.

<Addition of Ca (Calcium): 0.0005-0.003 mass %>

For example, in the case where the crystal grain refining elements such as Ti (Titanium), Zr (Zirconium), V (Vanadium) and the like are contained, if a trace of Ca (Calcium) is added, the crystal grain is more refined, and the effect that the structure is homogenized is obtained. In the case where the crystal grain refining elements such as Ti (Titanium) and the like are not contained, or in the case where if these are contained but the content does not satisfy the above-described range of the present invention, even if Ca (Calcium) is added, the effect of refining the crystal grain is not obtained. Moreover, even in the case where it is in the component range of the present invention, **if Ca (Calcium) content is less than 0.0005 mass %, the effect of refining the crystal grain is not obtained. In addition, in the case where it exceeds over 0.003 mass %, the dendrite structure becomes conspicuous, and the structure becomes heterogeneous.** Moreover, since if Ca (Calcium) content is too much, the pores may tend to be easily generated, it is more preferable that the upper limit of Ca (Calcium) content is made equal to or less than 0.002 mass %. Specification at page 26, line 14 to page 27, line 6 (emphasis added).

As known from Figs. 5-8, the crystal grain of alloys of Examples A1, A2 in which **Ca (Calcium) content is equal to or more than 0.0005 mass %** is finer and its structure is more homogenized comparing to those of alloys of Comparative Examples A3, A4 in which **Ca (Calcium) content is less than 0.0005 mass %**. Specification at page 45, lines 3-7 (emphasis added).

As known from Figs. 9-11, in alloys of Example B1 in which **Ca (Calcium) content is equal to or less than 0.003 mass %**, the alignment of dendrites is hardly observed, and the micro-structure is homogenized, however, in alloys of Comparative Examples B2, B3 in which **Ca (Calcium) content is more than 0.003 mass %**, the alignment of dendrites is clear and the micro-structure is heterogeneous. Specification at page 47, lines 17-23 (emphasis added).

Ca and P are generally not combined as in the present invention because the combination hinders the miniaturization of primary Si (Silicon) crystals in aluminum cast alloy by P. However, the present inventors discovered that the miniaturization of primary Si (Silicon) crystals by P is not appreciably hindered if the amount of Ca in the alloy is no more than 0.003 mass%, and that the addition of small amounts of Ca enhances the homogeneity of the aluminum alloy and the occurrence of fine crystal grains.

Because the cited prior art fails to suggest the limitation of independent Claims 1, 15, 26 and 31 of an aluminum cast alloy that comprises "Ca (Calcium) : 0.0005-0.003 mass %", the rejection under 35 U.S.C. § 103(a) should be withdrawn.

Pursuant to M.P.E.P. § 821.04, after independent product Claims 1 and 15 are allowed, Applicants respectfully request rejoinder, examination and allowance of withdrawn method Claims 7, 11-14, 20 and 24-25, which include all of the limitations of product Claims 1 and 15, respectively.

In view of the foregoing amendments and remarks, Applicants respectfully submit that the application is in condition for allowance. Applicants respectfully request favorable consideration and prompt allowance of the application.

Should the Examiner believe that anything further is necessary in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

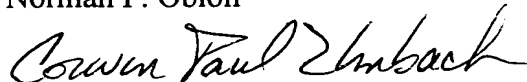
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